
Renal differentiation of amniotic fluid stem cells.

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Public Summary:

OBJECTIVES: The role of stem cells in regenerative medicine is evolving rapidly. Here, we describe the application, for kidney regeneration, of a novel non-genetically modified stem cell, derived from human amniotic fluid. We show that these pluripotent cells can develop and differentiate into de novo kidney structures during organogenesis in vitro. **MATERIALS AND METHODS:** Human amniotic fluid-derived stem cells (hAFSCs) were isolated from human male amniotic fluid obtained between 12 and 18 weeks gestation. Green fluorescent protein and Lac-Z-transfected hAFSCs were microinjected into murine embryonic kidneys (12.5-18 days gestation) and were maintained in a special co-culture system in vitro for 10 days. Techniques of live microscopy, histology, chromogenic in situ hybridization and reverse transcriptase polymerase chain reaction were used to characterize the hAFSCs during their integration and differentiation in concert with the growing organ. **RESULTS:** Green fluorescent protein and Lac-Z-transfected hAFSCs demonstrated long-term viability in organ culture. Histological analysis of injected kidneys revealed that hAFSCs were capable of contributing to the development of primordial kidney structures including renal vesicle, C- and S-shaped bodies. Reverse transcriptase polymerase chain reaction confirmed expression of early kidney markers for: zona occludens-1, glial-derived neurotrophic factor and claudin. **CONCLUSIONS:** Human amniotic fluid-derived stem cells may represent a potentially limitless source of ethically neutral, unmodified pluripotent cells for kidney regeneration.

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